WHAT IS CLAIMED IS:

1. A method, comprising:

generating histogram data using packet pairs received from a data source via a network, the histogram including a plurality of bins, the histogram data including bandwidth samples derived from received packet pairs;

spatially filtering the histogram data; and

estimating bandwidth available on the network using the spatially filtered histogram data.

2. The method of claim 1, wherein the packet pairs are interspersed in a real-time data stream.

3. The method of claim 1, wherein generating histogram data comprises:

receiving a packet pair transmitted by the data source via the network;

deriving a bandwidth sample from dispersion in the received packet pair; and

classifying the sample into a bin of the plurality of bins.

4. The method of claim 1, wherein the plurality of bins are of uniform bin width.

5. The method of claim 1, wherein the plurality of bins are organized into a hierarchical structure.

6. The method of claim 1, wherein generating histogram data comprises aging previously generated histogram data.

7. The method of claim 6, wherein aging previously generated histogram data comprises reducing the value a sample contributes to a bin count of a bin containing the sample.

8. The method of claim 1, wherein spatially filtering histogram data comprises providing compensation for a bin having different number of bins used in the spatial filtering on one side than its other side.

9. The method of claim 1, wherein spatially filtering histogram data comprises:

averaging samples in a first bin of the plurality of bins to form a bin average for the first bin; and

filtering the bin count of the first bin as a function of the bin count of the first bin and a bin count of a second bin of the plurality of bins to form a smoothed bin count for the first bin.

10. The method of claim 9, further comprising filtering the bin average of the first bin using the bin average of the first bin and a bin average of the second bin.

11. The method of claim 9, wherein filtering the bin count of the first bin is a function of the bin count of the first bin and the bin counts of other bins of the plurality of bins, the other bins including the second bin.

12. The method of claim 9, wherein filtering the bin count of the first bin comprises calculating a weighted average of the bin counts of the first and second bins.

13. The method of claim 12, wherein the first and second bins are adjacent.

14. The method of claim 12, wherein a kernel density estimation algorithm is used to determine weights used in calculating the weighted average.

15. The method of claim 14, wherein the kernel density estimation algorithm includes using a linear kernel.

16. The method of claim 14, wherein the kernel density estimation algorithm includes a Gaussian kernel algorithm.

17. The method of claim 11, wherein a kernel density estimation algorithm is used to determine the range and weights of the other bins used in filtering the bin count of the first bin.

18. The method of claim 10, further comprising selectively spatially filtering lower level bins of a bin of the plurality of bins in response to that bin having a smoothed bin count greater than those of the other bins of the plurality of bins.

19. The method of claim 1, wherein estimating bandwidth available on the network comprises selecting a bin average of the bin of the plurality of bins having the largest smoothed bin count.

20. The method of claim 1, wherein estimating bandwidth available on the network comprises selecting a smoothed bin average of the bin of the plurality of bins having the largest smoothed bin count

21. The method of claim 19, wherein estimating bandwidth available on the network further comprises temporally filtering the selected bin average.

22. The method of claim 20, wherein estimating bandwidth available on the network further comprises temporally filtering the selected smoothed bin average.

23. The method of claim 21, wherein temporally filtering the selected bin average comprises calculating a weighted average of the selected bin average and a previous estimation of the bandwidth available on the network.

24. The method of claim 22, wherein temporally filtering the selected bin average comprises calculating a weighted average of the selected smoothed bin average and a previous estimation of the bandwidth available on the network.

25. A computer-readable medium having computer-executable instructions to perform operations comprising:

generating histogram data using packet pairs received from a data source via a network, the histogram including a plurality of bins, the histogram data including bandwidth samples derived from received packet pairs;

spatially filtering the histogram data; and

estimating bandwidth available on the network using the spatially filtered histogram data.

26. The computer-accessible medium of claim 25, wherein the packet pairs are interspersed in a real-time data stream.

27. The computer-accessible medium of claim 25, wherein generating histogram data comprises:

receiving a packet pair transmitted by the data source via the network;

deriving a bandwidth sample from dispersion in the received packet pair; and

classifying the sample into a bin of the plurality of bins.

28. The computer-accessible medium of claim 25, wherein the plurality of bins have uniform bin widths.

29. The computer-accessible medium of claim 25, wherein the plurality of bins are organized into a hierarchical structure.

30. The computer-accessible medium of claim 25, wherein generating histogram data comprises aging previously generated histogram data.

31. The computer-accessible medium of claim 30, wherein aging previously generated histogram data comprises reducing the value a sample contributes to a bin count of a bin containing the sample.

32. The computer-accessible medium of claim 25, wherein spatially filtering histogram data comprises providing compensation for a bin having different number of bins used in the spatial filtering on one side than its other side.

33. The computer-accessible medium of claim 25, wherein spatially filtering histogram data comprises:

averaging samples in a first bin of the plurality of bins to form a bin average for the first bin; and

filtering the bin count of a first bin as a function of the bin count of the first bin and a bin count of a second bin of the plurality of bins to form a smoothed bin count for the first bin.

34. The computer-accessible medium of claim 33, further comprising filtering the bin average of the first bin using the bin average of the first bin and a bin average of a second bin.

35. The computer-accessible medium of claim 33 wherein filtering the bin count of the first bin is a function of the bin counts of the first bin and of other bins of the plurality of bins.

36. The computer-accessible medium of claim 33, wherein filtering the bin count of the first bin comprises calculating a weighted average of the bin count of the first and second bins.

37. The computer-accessible medium of claim 36, wherein the first and second bins are adjacent.

38. The computer-accessible medium of claim 36, wherein a kernel density estimation algorithm is used to determine weights used in calculating the weighted average.

39. The computer-accessible medium of claim 38, wherein the kernel density estimation algorithm includes using a linear kernel.

40. The computer-accessible medium of claim 38, wherein the kernel density estimation algorithm includes using a Gaussian kernel.

41. The computer-accessible medium of claim 35, wherein a kernel density estimation algorithm is used to determine ranges and weights of the other bins used filtering the bin average of the first bin.

42. The computer-accessible medium of claim 33, further comprising selectively spatially filtering lower level bins of a bin of the plurality of bins in response to that bin having a smoothed bin count greater than those of the other bins of the plurality of bins.

43. The computer-accessible medium of claim 25, wherein estimating bandwidth available on the network comprises selecting a bin average of the bin of the plurality of bins having the largest smoothed bin.

44. The computer-accessible medium of claim 25, wherein estimating bandwidth available on the network comprises selecting a smoothed bin average of the bin of the plurality of bins having the largest smoothed bin.

45. The computer-accessible medium of claim 43, wherein estimating bandwidth available on the network further comprises temporally filtering the selected bin average.

46. The computer-accessible medium of claim 44, wherein estimating bandwidth available on the network further comprises temporally filtering the selected smoothed bin average.

47. The computer-accessible medium of claim 45, wherein temporally filtering the selected bin average comprises calculating a weighted average of the selected bin average and a previous estimation of the bandwidth available on the network.

48. The computer-accessible medium of claim 46, wherein temporally filtering the selected bin average comprises calculating a weighted average of the selected smoothed bin average and a previous estimation of the bandwidth available on the network.

49. A system, comprising:

a network interface to receive data from a data source coupled to a network; and

a bandwidth estimator to estimate available bandwidth on the network, the bandwidth estimator including:

a histogram generator to generate histogram data derived from packet pairs the sent by the data source and received via the network interface, the histogram data including bandwidth samples contained in one or more bins of a plurality of bins; and

a spatial filter to filter histogram data from the histogram generator.

50. The system of claim 49, wherein the histogram data has a hierarchical structure.

51. The system of claim 49, wherein the histogram generator is further to age the histogram data when a packet pair is received.

52. The system of claim 49, wherein the packet pairs conform to a Real-time Transport Control Protocol (RTCP) and are interspersed in a data stream conforming to a Real-time Transport Protocol (RTP).

53. The system of claim 49, wherein the spatial filter is to calculate a smoothed bin count of a selected bin included in the histogram data using a weighted average of the selected bin's bin count and the bin count of another bin included in the histogram data.

54. The system of claim 53, wherein the bandwidth estimator is to estimate the available bandwidth on the network as a function of the smoothed bin count and bin average of the bin having the largest smoothed bin count, wherein a bin's bin average is an average value of all samples contained in that bin.

55. The system of claim 53, wherein the spatial filter is further to calculate a smoothed bin average using a weighted average of a selected bin's bin average and the other bin's bin average, wherein a bin's bin average is an average value of all samples contained in that bin.

56. The system of claim 55, wherein the bandwidth estimator estimates the available bandwidth on the network as a function of the smoothed bin count and the

smoothed bin average of the bin having the largest smoothed bin count, wherein a bin's bin average is an average value of all samples contained in that bin.

57. The system of claim 55, wherein the selected bin and the other bin are adjacent bins.

58. The system of claim 57, wherein the spatial filter is further to calculate a smoothed bin average using a weighted average of a selected bin's bin average, the other bin's bin average and a compensation factor when the selected bin has only one adjacent bin, wherein a bin's bin average is an average value of all samples contained in that bin.

59. The system of claim 55, wherein the weights used in the weighted average are determined using a kernel density algorithm.

60. The system of claim 59, wherein the kernel density algorithm comprises a linear kernel density algorithm.

61. The system of claim 59, wherein the kernel density algorithm comprises a Gaussian kernel density algorithm.

62. The system of claim 59, wherein the bandwidth estimator further comprises a temporal filter.

63. The system of claim 62, wherein the temporal filter is to calculate a weighted average of a selected smoothed bin average and a previous estimation of the bandwidth available on the network, the smoothed bin average being calculated using a weighted average of the selected bin's bin average and another bin's bin average, wherein a bin's bin average is an average value of all samples contained in that bin.

64. A computer-readable medium having components comprising:

a bandwidth estimator to estimate available bandwidth on a network, the bandwidth estimator including:

a histogram generator to generate histogram data derived from packet pairs the sent by a data source over the network, the histogram data including bandwidth samples contained in one or more bins of a plurality of bins; and

a spatial filter to filter histogram data from the histogram generator.

65. The computer-readable medium of claim 64, wherein the histogram data has a hierarchical structure.

66. The computer-readable medium of claim 64, wherein the histogram generator is further to age the histogram data when a packet pair is received.

67. The computer-readable medium of claim 64, wherein the packet pairs conform with a Real-time Transport Control Protocol (RTCP) and are interspersed in a data stream conforming with a Real-time Transport Protocol (RTP).

68. The computer-readable medium of claim 64, wherein the spatial filter is to calculate a smoothed bin count of a selected bin included in the histogram data using a weighted average of the selected bin's bin count and the bin count of another bin included in the histogram data.

69. The computer-readable medium of claim 68, wherein the bandwidth estimator is to estimate the available bandwidth on the network as a function of the smoothed bin count and bin average of the bin having the largest smoothed bin count, wherein a bin's bin average is an average value of all samples contained in that bin.

70. The computer-readable medium of claim 68, wherein the spatial filter is further to calculate a smoothed bin average using a weighted average of a selected bin's bin average and the other bin's bin average, wherein a bin's bin average is an average value of all samples contained in that bin.

71. The computer-readable medium of claim 70, wherein the bandwidth estimator is to estimate the available bandwidth on the network as a function of the smoothed bin count and the smoothed bin average of the bin having the largest smoothed bin count.

72. The computer-readable medium of claim 68, wherein the selected bin and the other bin are adjacent bins.

73. The computer-readable medium of claim 72, wherein the spatial filter is further to calculate a smoothed bin average using a weighted average of a selected bin's bin average, the other bin's bin average and a compensation factor when the selected bin has only one adjacent bin, wherein a bin's bin average is an average value of all samples contained in that bin.

74. The computer-readable medium of claim 68, wherein the weights used in the weighted average are determined using a kernel density algorithm.

75. The computer-readable medium of claim 74, wherein the kernel density algorithm comprises a linear kernel density algorithm.

76. The computer-readable medium of claim 74, wherein the kernel density algorithm comprises a Gaussian kernel density algorithm.

77. The computer-readable medium of claim 64, wherein the bandwidth estimator further comprises a temporal filter.

78. The computer-readable medium of claim 77, wherein the temporal filter is to calculate a weighted average of a selected smoothed bin average and a previous estimation of the bandwidth available on the network, the smoothed bin average being calculated using a weighted average of the selected bin's bin average and another bin's bin average, wherein a bin's bin average is an average value of all samples contained in that bin.

79. A system, comprising:

means for receiving data from a data source coupled to a network; and

means for generating histogram data from packet pairs the sent by the data source and received via the means for receiving, the histogram data including bandwidth samples contained in one or more bins of a plurality of bins; and

means for spatially filtering histogram data generated by the means for generating.

80. The system of claim 79, wherein the histogram data has a hierarchical structure.

81. The system of claim 79, wherein the means for generating further comprises means for aging histogram data.

82. The system of claim 79, wherein the packet pairs conform with a Real-time Transport Control Protocol (RTCP) and are interspersed in a data stream conforming with a Real-time Transport Protocol (RTP).

83. The system of claim 79, wherein the means for spatially filtering calculates a smoothed bin count of a selected bin included in the histogram data using a weighted average of the selected bin's bin count and the bin count of another bin included in the histogram data.

84. The system of claim 83, further comprising means for estimating available bandwidth on the network as a function of the smoothed bin count and bin average of the bin of the plurality of bins that has the largest smoothed bin count, wherein a bin's bin average is an average value of all samples contained in that bin.

85. The system of claim 83, wherein the means for spatially filtering is also for calculating a smoothed bin average using a weighted average of a selected bin's bin average and the other bin's bin average.

86. The system of claim 85, further comprising means for estimating available bandwidth on the network as a function of the smoothed bin count and smoothed bin average of the bin of the plurality of bins that has the largest smoothed bin count.

87. The system of claim 83, wherein the selected bin and the other bin are adjacent bins.

88. The system of claim 87, wherein the means for spatially filtering is also for calculating a smoothed bin average using a weighted average of a selected bin's bin average, the other bin's bin average and a compensation factor when the selected bin has only one adjacent bin, wherein a bin's bin average is an average value of all samples contained in that bin.

89. The system of claim 83, wherein the weights used in the weighted average are determined using a kernel density algorithm.

90. The system of claim 79, further comprising means for temporally filtering the spatially filtered data.

91. The system of claim 90, wherein the means for temporally filtering calculates a weighted average of a selected smoothed bin average and a previous estimation of the bandwidth available on the network, the smoothed bin average being calculated using a weighted average of the selected bin's bin average and another bin's bin average.

92. A computer-readable medium having components as recited in claim 79.

93. A method to estimate available bandwidth on a network, the method comprising:

transmitting packet pairs over the network at a first rate when a data transfer session starts; and

transmitting packet pairs over the network at a second rate after transmitting a predetermined number of packet pairs at the first rate, wherein the first rate is higher than the second rate.

94. The method of claim 93 wherein the packet pairs conform with a Real-time Transport Control Protocol (RTCP) and are interspersed in a data stream conforming with a Real-time Transport Protocol (RTP).

95. A computer-readable medium having instructions for performing the method recited in claim 93.

96. A system to estimate available bandwidth on a network, the system comprising:

means for transmitting packet pairs over the network at a first rate when a data transfer session starts; and

means for transmitting packet pairs over the network at a second rate after a predetermined number of packet pairs have been transmitted at the first rate, wherein the first rate is higher than the second rate.

97. The system of claim 96 wherein the packet pairs conform with a Real-time Transport Control Protocol (RTCP) and are interspersed in a data stream conforming with a Real-time Transport Protocol (RTP).

98. A computer-readable medium having components as recited in claim 96.

99. A method to discriminate between different types of network connections, the method comprising:

receiving a packet pair from a network, wherein the packet pair includes round trip time (RTT) information;

estimating available bandwidth in a network as a function of the dispersion of the received packet pair; and

selecting a network connection type from a predetermined set of network connection types in response to the RTT and estimated available bandwidth.

100. The method of claim 99 wherein the packet pair conforms with a Real-time Transport Control Protocol (RTCP) and is injected in a data stream conforming with a Real-time Transport Protocol (RTP).

101. A computer-readable medium having instructions for performing the method recited in claim 99.

102. A system for discriminating between different types of network connections, the system comprising:

means for receiving a packet pair from a network, wherein the packet pair includes round trip time (RTT) information;

means for estimating available bandwidth in a network as a function of the dispersion of the received packet pair; and

means for selecting a network connection type from a predetermined set of network connection types in response to the RTT and estimated available bandwidth.

103. The system of claim 102 wherein the packet pair conforms with a Real-time Transport Control Protocol (RTCP) and is inserted in a data stream conforming with a Real-time Transport Protocol (RTP).

104. A computer-readable medium having components as recited in claim 102.